



Learn How to Select the Best Power Supply for Your Application

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Electronic devices require a reliable source that can supply power at all times. But since power supplies are available in a wide range of voltage and current ratings, the engineer tasked with selecting an appropriate power supply must resolve numerous questions to determine the right supply for an application. Following is a look at two main power supply design topologies: switching and linear regulated power supplies.



Linear vs. Switching: The Facts

Switching power supplies regulate the output voltage using a high frequency switching technique that employs pulse width modulation and feedback. Power is supplied from the input to the output by turning on a switch until the desired voltage is reached. Once the output voltage reaches the predetermined value, the switch element is turned off and no input power is consumed. Generally speaking, switching power supplies are smaller, lighter and more efficient than linear power supplies. For example, a 250 W linear power supply would require 600 in³ of mounting space and weighs 26 lb, while a comparable AC-DC switching power supply would require 60 in³ of mounting space and weighs 2 lb.

Switching supplies can either step-up or step-down the input voltage to get the desired output voltage. Among the applications where a switching power supply may be preferable are high power/high current applications, portable equipment, control systems, DC motors, aviation and marine applications, network equipment, electrolysis and waste treatment operations.

A linear power supply typically uses a large transformer to drop voltage from an AC line to a much lower AC voltage, and then uses a rectifier to change to DC voltage. The DC voltage is then fed through a moderately complex regulator circuit to achieve very low load and line regulation and a filtering process to produce a very clean DC voltage.

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Linear power supplies typically step-down an input voltage to produce a lower output voltage. While larger, heavier than and not as efficient as a comparable switching supply, the linear unit has beneficial attributes that the switcher supply cannot match. For example, the linear supply has no discrete time clocking or switching action. As a result, the output is virtually noise and ripple free. Typical applications of linear regulated power supplies include telecommunications equipment, medical equipment, laboratory test equipment, low noise amplifiers, advanced signal processing and data acquisition systems (sensors, multiplexers, A/D converters and sample and hold circuits), and precision measurement devices.

Applications Where Failure Cannot Be Tolerated

When the reliability of a system is essential, and a sudden loss of power would lead to disaster, two reliable power sources are necessary.

One way to keep DC power flowing, no matter what it is powering, is to use a Redundant Power Package. In a redundant arrangement, more than one power supply feeds a single voltage bus. If one power supply fails, the other continues to provide the entire power needs of that bus. Furthermore, a separate AC feed to each power supply input helps stem failure on the primary side.

It takes more than simply paralleling the outputs of two or more power supplies to have a redundant power system that functions as intended. Redundant Power Packages contain two identical power supplies with their outputs interconnected through a diode switching arrangement that will detect any fault condition, isolate it from the system output and pass only the output of the other supply with no interruption of output power during the transition. Redundant Power Packages come with various features including over- and undervoltage, surge protection, isolation diodes, alarms and remote voltage sensing.



Figure 1: The Acopian R24W9 Redundant Power Package
Source: Acopian Power Supplies

Acopian offers a range of rugged, redundant, active-active (N+1) and active-passive power supplies and systems designed to ensure that a power source remains uninterrupted, even in the event of failure. The company's redundant power supply packages use linear-regulated or switching-regulated power supplies and are available in wall-mounted, rack-mounted, bench top, low-profile, modular, programmable, and pluggable models. Connect the input and output terminals, and the power system is protected.

DIN rail supplies

Power supplies that can be mounted on a DIN rail are frequently utilized in control panels and electrical cabinets for industrial control, building control, instrumentation and automation applications. Control systems typically have functional modules clipped to DIN rails for operational flexibility and easy access. These DIN rail power supplies provide industry standard 12 V, 24 V or 48 V DC. Application requirements often dictate that these supplies must withstand harsh environmental conditions.

Acopian makes DIN rail mountable power supplies in AC-DC single, dual tracking, isolated, dual-isolated, triple-isolated and wide adjust output. The company also offers DIN rail mountable DC-DC converters and DC-DC high voltage outputs, available in numerous profiles, configurations and power levels, up to 30,000 V.



Figure 2: The EB35DIN Mounting Kit.
Source: Acopian Power Supplies

Acopian provides simple DIN rail mounting kits for many of its power supplies. For instance, the EB35DIN mounting kit consists of an aluminum plate, with two DIN clips attached to it, and four screws for attaching the plate to the bottom of any Mini Encapsulated Power Supply with screw terminals or any Mini DC-DC Converter with screw terminals. The power supply can then be snapped onto a 35 mm 'top hat' type of DIN rail.

Low Noise Supplies

Electrical devices switching on and off create electrical noise with a fundamental at its clock frequency as well as numerous harmonics. One source of conducted electromagnetic interference (EMI) is ripple in the converter's output. Ripple can be a factor because rectifying and filtering a switching power supply's output results in an AC component that comes with its DC output. Typical noise levels are on the order of hundreds of microvolts to tens of millivolts. This is unacceptable in medical equipment, low noise amplifiers, signal processing, data acquisition, automatic test equipment and laboratory test equipment.

Linear regulated power supplies have very little ripple and very little output noise, making them suitable for laboratory, medical and instrumentation applications. Equipment that generates and manages X-ray data, requiring reliable, consistent and clean power is an example. Acopian provided linear power supplies for a dark room environment for developing X-ray imagery. The Acopian solution provided all LED indicators and digital meter lighting capable of being switched off while the power system was still in use; toggle switches on the front panel provided individual control of LED indicators and digital meter backlighting.



Custom Power Supplies

For the defense industry, components need to withstand extreme environmental conditions faced by the military. In particular, power supply systems must be designed and qualified in accordance with strict manufacturing, environmental and operational Military Specification (MIL-SPEC).

MIL-STD-704 (Aircraft Electrical Power Characteristics) for instance, is a U.S. military standard that defines a standardized power interface between a military aircraft and its equipment and carriage stores, covering such topics as voltage, frequency, phase, power factor, ripple, maximum current, electrical noise and abnormal conditions for both AC and DC systems. The unique requirements and specifications for defense applications may mean that standard switching power supplies do not meet design needs.

Speeding time to market are tools such as the online Acopian Custom System Builder. From the number of outputs to the type of circuit design, an engineer using this tool can easily custom design DC-DC & AC-DC power supplies with just a few clicks.



Why Acopian?

Since 1957, Acopian Power Supplies has manufactured a diverse line of AC-to-DC & DC-to-DC power supplies including linear, unregulated and switching power supply models as well as Redundant Power Packages using linear regulated or switching regulated power supplies and multiple-output power systems. Capabilities include shipping most models within three days (redundant and multiple output systems in nine days). Standard power supplies are available in all voltages from 0 V to 30 kV and up to 1200 W. Redundant and multiple-output power systems are available for rack, wall or DIN rail mounting and in modular configurations. Customized solutions are also available to meet special requirements.

For more information, visit [Acopian](http://Acopian.com).

Acopian: An ISO 9001:2015 Certified Company

Acopian has been designing and manufacturing power supplies since 1957. Our products include AC-DC power supplies, DC-DC converters; redundant & multiple-output power systems. Capabilities include shipping most models within 3 days and redundant and multiple output systems in 9 days. Standard power supplies are available in all voltages from 0v to 30 kV and up to 1200W. Standard models include single, dual, triple and wide adjust output power supplies; switching, linear, regulated & unregulated power supplies; programmable, high voltage, universal input & mini power supplies; & NEMA 4X Enclosed & UL508 listed configurations. Redundant and multiple-output power systems are available for rack, wall or DIN rail mounting and in modular configurations. Customized solutions are also available to meet special customer requirements. Our products are made in the USA.

